

DEVELOPING A FRAMEWORK FOR MEASURING THE SUPPLY CHAIN CAPABILITY

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ABSTRACT

Because the business environment has changed (e.g., volatility in demand, curtailment of product life cycle, changing of information technology, and so forth), corporate supply chains become more network-connected and involve more business partners. Whether the company has the capability to operate well in such supply chain network becomes a significant issue. This paper presents the preliminary findings from an explorative case study concerning corporate supply chain capability. The empirical findings show that developing technology capability, reducing transaction related risks, maintaining good relationships, and resolving environmental uncertainty are four key items to form the construct of supply chain capability. Therefore, our contribution is to provide researchers and practitioners a framework to measure supply chain capability, so that companies that owning high supply chain capability are able to achieve better supply chain performance.

Keyword: Supply chain capability, Interorganizational systems, Information technology, Supply chain management, Case study

INTRODUCTION

Supplier-customer relationships have undergone radical changes in recent years because the business environment has changed (e.g., volatility in demand, curtailment of product life cycle, changing of information technology, and so forth). Many enterprises have been typically moving away from vertical integration toward more external contracting of key activities, thereby building a complex network of firms. Accordingly, the issue such as how to maintain good supply chain capabilities to handle the increasing complexity and dynamism is becoming more important than ever.

This study seeks to better explain the supply chain capability construct. Although previous research have contributed greatly to our understanding of how firms should build a good collaborative relationship with trading partners (Angeles and Nath 2000, Dyer and Singh 1998,

Hart and Saunders 1998, Kumar and van Dissel 1996), they overlook the important fact that a good performance of supply chain collaboration may depend not only on the firm itself, but also on the whole network of relationships in which the firm is embedded. To make the supply chain collaboration successful, it is important to offer an integrated view of what capabilities a supply chain should obtain in terms of transaction handling capabilities, relationship capabilities, IT capabilities, and so on. We believe that a systematic investigation of these influences could offer significant insights for firms to manage their supply chain network.

LITERATURE REVIEW

There have been a series of in-depth studies about successful supply chain management. We discover that their perceived supply chain capabilities can approximately group into four levels: technology level, transaction level, relationship level, and environment level (Bensaou and Venkatraman 1995, Clemons and Row 1993, Dyer and Singh 1998, Dwyer, Schurr, and Oh 1987, Hart and Saunders 1998).

Many researchers put their focus on the development of inter-organizational system (IOS) technologies. They argue that implementing IOS technology can help corporations improve the transaction efficiency with their trading partners, thus becoming a significant supply chain capability the corporate would like to pursue (Bensaou and Venkatraman 1995). The researchers also recognize that IOS project is inherently risky to participating firms due to the possibility of opportunistic behavior by another party to the relationship. A good supply chain management should have mechanisms such as pre-established concurrency control and security mechanisms to handle such transaction risks (Clemons and Row 1992, Kumar and van Dissel 1996).

According to previous research, firms that have capabilities to maintain good relationships with trading partners can reduce transaction costs, negotiation costs, and uncertainty about the opportunistic behavior, thereby having a positive effect on performance. Further, better cooperative relationships between two parties allow them to work out difficulties such as power conflict, low profitability, and so forth (Hart and Saunders 1998). Some studies also notice the significance of environmental uncertainty on the development of cooperative relationships. Bensaou and Venkatraman (1995) argue that focal firm needs more commitments, more specific technology investment, and longer period of contract to control and maintain their commercial exchange with trading partners while under a more dynamic and uncertain environment.

RESEARCH FRAMEWORK

According to our previous discussion, although each concept is important to investigate supply chain capabilities, there is no comprehensive framework to consider all important supply chain capabilities together. Therefore we aim to derive from the previous research concepts to develop a supply chain capability construct. We argue that an enterprise with good supply chain capability should be able to handle the supply chain collaboration more successfully. These views are synthesized into the following definition and are characterized by Figure 1:

Supply chain capability is a company-owned ability to well operate company's supply chain networks, which can efficiently aid the companies to handle the collaborative activities with their trading partners. The scope of considering the supply chain capability is from the basic technology level to the environment level, which includes how to develop technology capability, how to reduce the transaction risk, how to promote a good relationship, and how to resolve the uncertainty in the dynamic environment.

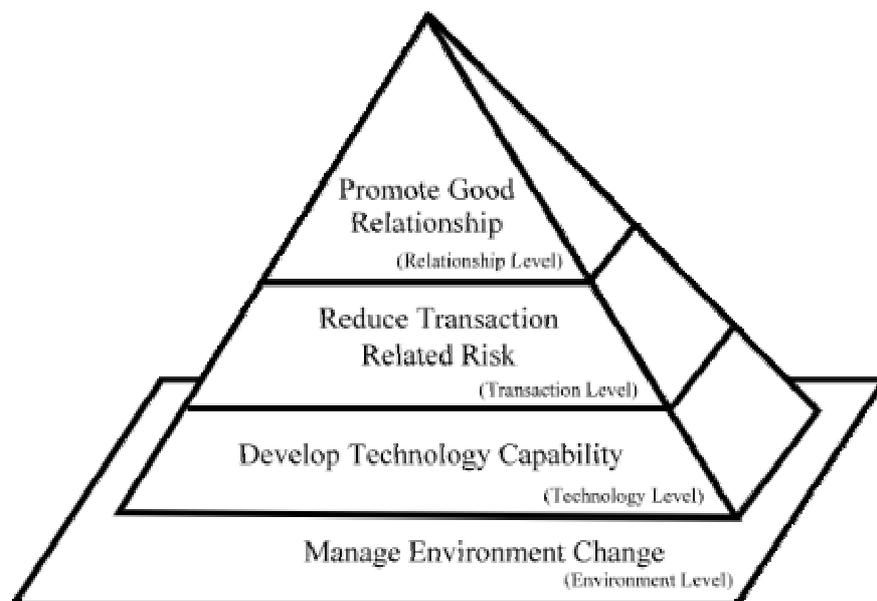


Figure 1. Research Framework for the Development of Supply Chain Capability Construct

In reviewing the related literature in the past decade, several supply chain research models are discovered to be most related with our development. They are proposed by Angeles and Nath (2000), Bensaou and Venkatraman (1995), Clemons and Row (1993), Dyer and Singh (1998), Kumar and ven Dissel (1996). The resulting factors taken from combining these models are (1) IOS usage and integration, (2) transaction-specific capital, (3) information symmetries, (4) resources control, (5) trust, (6) complementarity, (7) management dependency, (8) the

management of information uncertainty, and (9) the management of selling/buying uncertainties. The first one addresses company's IT capability, the next three are related with the resolution of transaction risk, the following three contribute to good supply chain relationships, and the last two are factors of managing environmental uncertainty.

RESEARCH METHOD

We use multiple-case study to justify our proposed model. Three companies have been chosen on the basis of representativeness and accessibility, following the criteria of having had an interorganizational-connection for a long period and being well-known company in Taiwan PC industry. X Inc. is a leading passive component supplier that was founded in 1977 in Taiwan. Y Co., Ltd. is the No.1 semiconductor distributor in Asia that provides committed service to satisfy needs of suppliers and customers. Z Electronics Inc. is one of the world leading manufacturers of computer notebooks.

ANALYSIS AND RESULTS

Although these three companies play different roles in the PC industry and have their own challenges and concerns, they all consider cooperating closely with each other is important to increase the benefits in the industry. The analysis is as follows.

According to the case companies, firms with high level of IOS usage and integration are perceived to have high IT capability to handle supply chain collaboration. Besides, just as firms that have integrated IOS are able to increase productivity, reduce period of exchange, and increase the benefits between trading partners, alliance partners are also able to increase the efficiency associated with inter-firm exchanges through the IOS usage and integration. As the Specialist of IT Department in Y Co, Ltd. comments:

After the IOS connects our order receiving process with suppliers' purchasing process, our business assistants do not have to input the same data in different systems...we (trading partners and Y Co, Ltd.) can reduce the error rate and accelerate the response time.

Based on the interview, the modularity and replicability of know-how and industrial standards can reduce the risks resulting from investing the transaction-specific capital. In addition, information technology can handle the loss of resource control by pre-established concurrency control and security mechanisms. Further, explicit regulation to measure the trading performance,

such as supplier score card is the way to handle the information asymmetries. As the specialist of IT department in Y Co. Ltd refers, the lessons learnt from collaborating with some well-known suppliers help them to implement the similar IOSs with other suppliers more quickly and efficiently. The modularity and replicability of know-how also happen in the X Inc. The accumulated knowledge enables the company to proactively assist the industrial followers who want to adopt similar IOS. The Director of IT Department in Y Co, Ltd. puts:

In the initial IOS implementation stage, each IOS link needs separate efforts to build. However, along with the increased number of IOS links, the time used in building the new link is highly reduced. In other words, the experience can be easily replicated to the next implementation, which reduce our effort of investing IOS and accelerate the implementation of the interorganizational collaboration projects.

To maintain good relationships with trading partners, it is important for the powerful companies to provide the subsidies such as production co-design, quality control, as well as forecasting and inventory management, so that the dependency companies are willing to keep the long-term transaction relationship. As the Specialist of Procurement Department in Z Electronics Inc. mentions:

When we trade with some well-known CPU supplier, we have to follow its transaction rules...the supplier will provide the cost premiums to subsidize our effort...the relationship between this supplier and us is more than buying-selling relationship.

According to the interviewees, uncertainty comes from the unpredictable customers' demand and therefore exceptions such as order change or order dissolution frequently happens. Taking X Inc. as an example, they must coordinate with each individual buyer to solve the exception, because each buyer has different procedures to handle such problem. In addition, the buyer forecast is very inaccurate, so X Inc. needs to prepare a lot of inventory to meet buyer's demand. As the Director of IT Department in X Inc. comments:

Despite we have a pre-established procedure to handle the order change, the frequency of order change is too high to satisfy the customer's needs. Therefore, we need to rely on inventory to solve the problem.

DISCUSSION

According to the interview of these case companies, intensity and scope of IOS can contribute to

supply chain performance. There are many benefits resulting from IOS usage, such as reducing transaction cost, improving transaction efficiency, and simplifying the transaction processes. These benefits motivate the supply chain members to increase the intensity and scope of IOS usage. In terms of reducing transaction-related risk, case companies' effective knowledge sharing in the implementation of IOS can reduce the efforts in building inter-organizational cooperation and assisting the trading partners to implement IOS. In addition, not all case companies are willing to follow the industrial standard for sharing their processes. Instead, some companies would like to take uncertainties in exchange for controlling all technology resources on hand. It is also interesting to note that these companies are often those with more market power and higher technology capability.

To maintain good relationships, all case companies agree trust, complementarity, and management dependency are key factors. However they also refer the difficulties to build the consensus while sharing the processes. Actually, most relationships in the supply chain are interdependent, that is, good supply chain collaboration does not depend on the initiators only, but also the partners. For the handling of environment uncertainties such as volatile customer demand, most case companies mention that they are willing to do forecast collaboration with their trading partners. However they all express their inability to predict all contingent uncertain factors and in most of the time they handle the uncertainty passively.

CONCLUSIONS

Many organizations are reengineering their business processes in order to take full advantage of supply chain collaboration. This paper seeks to uncover the key company-owning capability that can contribute to the supply chain collaboration. To test the applicability of this model, we conduct interviews with three companies in Taiwan PC industry. Though these companies play different role in the PC industry, all of them agree the technology capability, good relationship and risk resolution capability are success factors of supply chain collaborations, and thus companies owning these capabilities are able to achieve better supply chain performance. This work can be further verified by cross-industry case studies and general surveys in the future.

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